

WHAT IS CLAIMED IS:

1. A distance relay apparatus comprising:

a sampling element which samples an amount of
electricity of a voltage and a current, which are
5 received from an object to be protected, at regular
intervals;

an A/D converting element which converts the
amount of electricity sampled by the sampling element
into digital data;

10 a first directional relay element which receives
the digital data obtained by the A/D converting element
to perform computation to detect a fault, which occurs
in the forward direction from an installing point of
the relay apparatus, based on a computing equation;

15 a zone-1 distance relay element which receives the
digital data to perform computation to detect a fault
within a predetermined zone viewed from the installing
point of the relay apparatus, based on a computing
equation;

20 a fault detecting relay element which receives the
digital data to perform computation to detect a fault
within a zone that is narrower than that of the zone-1
distance relay element in terms of data time length
which is shorter than that used for the computation of
25 the zone-1 distance relay element; and

a logic element which outputs a relay signal in
accordance with a detecting operation of at least one

of the zone-1 distance relay element and the fault detecting relay element and a detecting operation of the first directional relay element.

2. The distance relay apparatus according to claim 1, wherein the first directional relay element, the zone-1 distance relay element and the fault detecting relay element receive the digital data, which is filtered by digital filters, and perform computation to detect a fault, and time required for filtering the digital data in the digital filter connected to the fault detecting relay element is shorter than time required for filtering the digital data in the digital filter connected to the first directional relay element and the zone-1 distance relay element.

3. The distance relay apparatus according to claim 1, wherein the first directional relay element, the zone-1 distance relay element and the fault detecting relay element receive the digital data, which is filtered by digital filters, and perform computation to detect a fault, and the data time length used for the computation in the fault detecting relay element is shorter than the data time length used for the computation in the first directional relay element and the zone-1 distance relay element.

4. The distance relay apparatus according to claim 1, further comprising a second directional relay element having a setting value that is larger than that

of the first directional relay element, and

wherein the logic element outputs the relay signal
in one of a case where both the second directional
relay element and the fault detecting relay element are
5 operated and a case where both the first directional
relay element and the zone-1 distance relay element are
operated.

5. The distance relay apparatus according to
claim 2, further comprising a second directional relay
10 element having a setting value that is larger than that
of the first directional relay element, and

wherein the logic element outputs the relay signal
in one of a case where both the second directional
relay element and the fault detecting relay element are
15 operated and a case where both the first directional
relay element and the zone-1 distance relay element are
operated.

6. The distance relay apparatus according to
claim 3, further comprising a second directional relay
20 element having a setting value that is larger than that
of the first directional relay element, and

wherein the logic element outputs the relay signal
in one of a case where both the second directional
relay element and the fault detecting relay element are
25 operated and a case where both the first directional
relay element and the zone-1 distance relay element are
operated.

7. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

8. The distance relay apparatus according to claim 2, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

9. The distance relay apparatus according to claim 3, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

10. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes a mho relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

11. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

12. The distance relay apparatus according to claim 2, wherein the fault detecting relay element

includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

13. The distance relay apparatus according to
5 claim 3, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

14. The distance relay apparatus according to
10 claim 4, wherein the fault detecting relay element includes a reactance relay having a setting value that is smaller than a distance setting value of the zone-1 distance relay element.

15. The distance relay apparatus according to
15 claim 1, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

16. The distance relay apparatus according to
20 claim 2, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

17. The distance relay apparatus according to
25 claim 3, wherein the fault detecting relay element includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

18. The distance relay apparatus according to
claim 4, wherein the fault detecting relay element

includes an undervoltage relay which detects that a voltage becomes not higher than a predetermined level.

19. The distance relay apparatus according to claim 1, wherein the fault detecting relay element
5 includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

20. The distance relay apparatus according to claim 2, wherein the fault detecting relay element
10 includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

21. The distance relay apparatus according to claim 3, wherein the fault detecting relay element
includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

15 22. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes an overcurrent relay which detects that a current becomes not lower than a predetermined level.

20 23. The distance relay apparatus according to claim 1, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

25 24. The distance relay apparatus according to claim 2, wherein the fault detecting relay element includes an impedance relay which obtains an impedance

from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

5 25. The distance relay apparatus according to claim 3, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than a predetermined level.

10 26. The distance relay apparatus according to claim 4, wherein the fault detecting relay element includes an impedance relay which obtains an impedance from the voltage and the current by computation and detects that the impedance becomes not higher than
15 a predetermined level.